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ABSTRACT

This paper reviews and illustrates what the computer offers the field of language arts. Two different approaches to computer assisted reading instruction available at the Naval Training Center in San Diego--the subskills and the holistic approaches--are described. The implications of computer assisted instruction for writing instruction are outlined and several specific approaches are suggested, including one presently in development. It is argued that the computer offers the language arts field a versatile device for evaluating and improving language skills; and that there is even greater potential for future development. (VT)

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IMPROVING LANGUAGE SKILLS BY COMPUTER

by

Robert A. Wisher

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Improving Language Skills by Computer

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There has been a steady decline in the language abilities of our population. Along with this decline come the editorials regarding the high school students who cannot read, the legislators who cannot write, and its composite impact on our society. And rightfully so. Of all the skills children are taught, most of us would probably agree that reading is the most essential, enabling skill for them to acquire. But as reading proficiency declines, so does writing ability. Today, one is likely to speak more in a week than write in a lifetime. Functional illiterates who cannot even write their own names may suffer embarrassment, but somehow they manage to subsist in our technological society. Those functional illiterates who cannot read street signs or follow simple directions, however, are so severely handicapped that it is questionable whether they can survive, much less thrive, in our society. A recent U.S. Office of Education study revealed that 22 percent of American adults do not have sufficient reading skills to effectively cope with daily life. The market for language improvement is large and probably growing.

Within the Navy, reading and writing skills are widely used in school and job settings. The use of these skills appears to increase in the more technical or data-oriented schools. A recent study showed that reading problems were experienced by 20 percent of students in Class A schools, 15 percent of persons in recruit training, and 15 percent of those performing on the job (Sticht, Fox, Hauke, and Zapf, 1977). A recent survey of entering recruits showed that 7.5 percent were reading below the 6'th grade level (Duffy, 1976). Compared to the average enlisted population, poor readers tend to have higher discharge rates, experience more difficulty in training, and perform less satisfactorily on the job. In the Navy, as in the nation, there is a need to improve language skills.

In an embryonic way, the computer is beginning to serve as an evaluator and instructor of language skills. It has yet to find its place, but we know that it belongs. This paper reviews and illustrates what the computer offers the field of language arts. Although the paper centers around reading skills and the computer, writing skills will also be considered. Several programs under development at the Navy Personnel Research and Development Center in San Diego will be highlighted.

Reading and the Computer

Reading has often been regarded as a coordination of various subskills which become automatized with practice (LaBerge and Samuels, 1974). Whether reading should be taught by a subskill approach or as a holistic process, however, is debated by educators (cf. Samuels, 1976; Smith, 1971). Whichever the preference, either approach can be implemented on the computer, and this will be demonstrated. Before elaborating on this, two other features of the computer-as-reading-instructor should be mentioned. First, the computer has a knack for motivating. Motivation is especially important for the illiterate adult

frustrated from previous attempts at learning to read. The patience of the computer is welcomed. Second, the computer has the capacity for individualizing instruction. Because of the intricacies of language and the unique linguistic experiences of its learners, the individualization feature becomes increasingly important. The instructor must adapt to the learner, and the computer does this well.

I have been working on a computer-assisted instruction project for remedial readers (below a 6'th grade reading level) from the Naval Training Center in San Diego. The computer system is a Digital Electronic Corporation PDP-11/45. The computer drives our multi-media system (MMS) learning stations. The MMS is is an on-line, instructional research facility providing state-of-the-art audio and video technology for lesson presentation and data collection. Critical to the reading program are the video cartridge player, audio cassette player, and digital voice synthesizer. (For a complete description of MMS, see Wisher,1977). Four MMS-equipped stations are available, and each may be used independently from the others.

Consider first how a subskills approach to reading instruction can be implemented. Our program includes three skill areas: phonics, vocabulary development, and comprehension. The phonics course drills the student on vowels, vowel blends, word beginnings and endings, homonyms, homographs, silent letters, synonyms, and antonyms. Each of these phonic units is further divided into a multitude of instructional units, and each unit is introduced by a computer-controlled, video tape lecture. There are twenty-five such lectures, each between 1 and 2 minutes in duration. Not only are they of instructional value, but they also serve as a diversion from the drill routines. The student is drilled on the phonic unit by seeing, hearing (via the voice synthesizer), and saying groups of words which share a particular sound. The course of instruction encourages substantial student-computer interaction; the student is free to have any word repeated via the synthesizer as many times as is desired. The response history from these interactions provides insights into the self-imposed remedial habits of the student.

Altogether, a corpus of several thousand words is presented in well-defined instructional units. Considerable time is spent quizzing the student on the current unit. If the student fails a quiz, the video lecture is repeated and a new set of drill words follows. Approximately 15 hours of instruction, distributed over 5 days, are available.

The vocabulary and comprehension skills area is incorporated in what we call reading theater. Reading theater operates in the following manner: the student views a video segment of actors engaged in a particular task , accompanied by an audio dialogue. The dialogue is instructional in nature, and is written at a level appropriate to the target population's reading ability. Occasionally, a special effects generator superimposes text on the monitor. Again, the video segments, text superimposition, and any response collection are under full computer control. A critical assumption of reading theater is that seeing and hearing an enactment summons comprehension. With de facto comprehension, instruction can then relate a written description to that which is already understood. The instruction extends accessibility to that knowledge rather than impose a new organization on it.

The role of the computer in reading theater is critical. Since the computer controls the video player, it can do so on the basis of a student's response. This occurs in the following manner: At various points in the play, the video halts but continues to display the superimposed text and waits for the student to respond. The superimposed text might be the dialogue or it might be a quiz about the video enactment, such as a cloze type test, word recognition probes, sentence completion tasks, or dialogue paraphrasings. Unlike many other strategies for teaching vocabulary and comprehension, reading theater begins with what is understood and traces that representation to a written form. Importantly, feedback to the superimposed textual material is immediate and can influence the course of instruction. For example, suppose the word " wrath" is used and graphically enacted during the play. The student might later be quizzed on the meaning of wrath; if correct, synonyms could be displayed and pronounced by a computer-controlled audio cassette, but if incorrect the segment with the enactment of wrath could be re-displayed. Vocabulary development occurs in this manner.

A similar approach to the skill of reading comprehension is available. At strategic points, the video stops and a comprehension question is displayed. Presumably the student comprehends the video but does not necessarily comprehend the written question or its four alternate anwers. If the students responds incorrectly, the appropriate video portion is redisplayed and the question is reworded. If correct, either a second question appears or the video continues. Note that both literal and inferential questions may be asked. Note also that the reading theater concept may be extended for many other instructional purposes.

The Computer and Reading-as-a-Holistic-Process

In addition to the subskills approach to teaching reading, a holistic approach to reading instruction is also available. A program called CAR (Computer-Assisted Reading) unobtrusively monitors reading progress while instructing the student. CAR displays text in a self-paced, sentence-by-sentence manner. The displayed sentence has a number of words underlined, each with a number beneath it. By pressing the appropriate number key, the student can have any underlined word pronounced by the voice synthesizer. Soon to be available is a word-meaning request facility: the student presses the shift key and the number of the underlined word - the voice synthesizer gives a definition of the word in the context in which it appears. The pronunciations and definitions are immediate.

Comprehension can be monitored by interrupting the sentence-by-sentence routine with a comprehension question and a choice of answers. If the answer is incorrect, the appropriate sentence or sentences that contain the answer are redisplayed. Interestingly, one can test for comprehension immediately or have a number of sentences intervene before the question appears. Since the number of words per sentence and the reading time are recorded, a sentence-by-sentence printout of reading rate is available.

Writing and the Computer

It is unlikely that the computer will ever approach the adeptness of a skilled writing instructor. Writing is a creative, generative process of composing and revising, all in a natural language. But the computer's ability to process natural language is very limited. Because of this restriction, one cannot simply type a paragraph into a computer and receive a printout of commentary as insightful as that of a writing instructor. On the other hand, the computer offers assistance in teaching various aspects of writing which are fundamental to sound composition.

Perhaps the greatest impact the computer will have on writing instruction stems from the organizational requirements of prose and the processing capacity of the computer. The organization, or disorganization, of a sentence or paragraph can readily be manipulated by a computer. When this manipulation is managed by the student but guided by various instructional objectives, the proper development of a written body unfolds, and the student plays a generative role in its development. Before providing some examples, let me discuss some hardware and software preferences for a computer-as-writing-instructor. A display screen is necessary and a rapid baud rate, 2400 or greater, is desired. Since text is continually manipulated, revised, or deleted diring the course of instruction, teletype printout soon becomes cumbersome. For the same reason, a programming language well-suited to string manipulation is desirable, such as SNOBOL. In some operating systems, the editor includes powerful manipulatory features, such as the editor in the UNIX system (Ritchie and Thompson, 1974).

I have been developing a writing-improvement program on our multi-media system. The program includes sentence-combining and paragraph-organization routines. The sentence-combining routine displays various phrases, each with a corresponding number, on a screen. The student's task is to combine the phrases in various ways so as to form a meaningful sentence. This is accomplished by pressing a sequence of number keys - the created sentence is displayed immediately. This routine graphically illustrates how phrases can be combined to form clauses, and how clauses combine to form sentences. At times, the computer can request that a sentence with a particular style be created, such as one beginning with a dependent clause and having a modal auxiliary to the main verb. Since the various number sequences which form such a sentence can be stored beforehand, the student can be given immediate feedback on the appropriateness of a response. Such sentence combining activities have proved to be effective in improving writing skills (O'Hare, 1973). Unlike normal classroom instruction, the computer can immediately rearrange the phrases, display them in a readable format, and provide feedback.

The paragraph-organization routine operates in a similar manner; instead of rearranging phrases into a sentence, one rearranges sentences into a paragraph. For example, six sentences might be listed on the screeen, each with a corresponding number. The student's first task is to identify the topic sentence, and then specify the order in which the sentences are to be arranged. The sentences then appear in paragraph form, but may be rearranged at the student's discretion. This allows the student to read the newly created paragraph, judge its "semantic flow", and make necessary revisions. Furthermore, the computer can request where the topic sentence be positioned, or it can request that a short sentence precede the topic sentence and so forth.

The student may be allowed to write and insert one sentence or to delete the sentence that is considered least important. Such exercises help to develop an understanding of the organizational structure of a paragraph as well as an appreciation for its style. The effectiveness of such instruction rests on the computers ability to update and redisplay the "working paragraph" immediately in contrast to the turnaround time typical in a classroom setting.

Final Comments

Both the subskills and holistic approaches to reading instruction have been implemented and are being evaluated against a regular classroom setting for remedial readers. The writing project is in development but a timetable has yet to be established for testing its effectiveness. In addition to these instructional routines, many traditional language assessment procedures can readily be implemented on the computer, such as reading comprehension and vocabulary tests. The computer, then, offers the language arts field a versatile device for evaluating and improving language skills. Reading can be taught by various approaches and classroom writing instruction can be supplemented with writing exercises. The impact the computer can have on impriving language skills has yet to be appreciated.

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